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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Applicant: New	)	Art Unit: 2189
	)	
Serial No.: 10/674,081	)	Examiner: Willhite
	)	
Filed: September 29, 2003	)	HSJ920030174US1
	)	
For:	)	July 23, 2007
	)	750 B STREET, Suite 3120
	)	San Diego, CA 92101
	)	

APPEAL BRIEF

Commissioner of Patents and Trademarks

Dear Sir:

This brief is submitted under 35 U.S.C. §134 and is in accordance with 37 C.F.R. Parts 1, 5, 10, 11, and 41, effective September 13, 2004 and published at 69 Fed. Reg. 155 (August 2004). This brief is further to Appellant's Notice of Appeal filed herewith.

Table of Contents

<u>Section</u>	<u>Title</u>	<u>Page</u>
(1)	Real Party in Interest.....	2
(2)	Related Appeals/Interferences.....	2
(3)	Status of Claims.....	2
(4)	Status of Amendments.....	2
(5)	Summary of Claimed Subject Matter .....	2
(6)	Grounds of Rejection to be Reviewed.....	3
(7)	Argument.....	5
App.A	Appealed Claims	
App.B	Evidence Appendix	
App.C	Related Proceedings Appendix	

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1189-14 APP

**RECEIVED**  
**CENTRAL FAX CENTER****JUL 23 2007**

CASE NO.: HSJ920030174US1

Serial No.: 10/674,081

July 23, 2007

Page 2

**PATENT**

Filed: September 29, 2003

**(1) Real Party in Interest**

The real party in interest is Hitachi Global Storage Technologies, Netherlands, B.V.

**(2) Related Appeals/Interferences**

No other appeals or interferences exist which relate to the present application or appeal.

**(3) Status of Claims**

Claims 1-4, 6-13, 15, 16, and 18-25 are pending and finally rejected, which rejections are appealed, and Claims 5, 14, and 17 have been canceled.

**(4) Status of Amendments**

No amendments are outstanding.

**(5) Summary of Claimed Subject Matter**

As an initial matter, it is noted that according to the Patent Office, the concise explanations under this section are for Board convenience, and do not supersede what the claims actually state, 69 Fed. Reg. 155 (August 2004), see page 49976. Accordingly, nothing in this Section should be construed as an estoppel that limits the actual claim language.

Claim 1 sets forth a hard disk drive (HDD) with a rotatable disk (reference numeral 12, figure 1; page 5, line 15) and a write element (14, figure 1; page 5, line 16) configured for writing data to the disk in isolated tracks and in bands composed of two or more tracks. A controller (28, figure 1; page 6, line 2) controls the

1189-14.APP

CASE NO.: HSI920030174US1

Serial No.: 10/674,081

July 23, 2007

Page 3

PATENT

Filed: September 29, 2003

write element and uses a log-structured file system (figure 3, page 9) defining segments, with each segment corresponding to a respective band and/or an isolated track. The log-structured file system uses an error correction code (ECC) block size that is larger than a physical sector size of the disk, and a cumulative ECC parity state between successive partial writes of an ECC block is retained (page 4, lines 2-4).

Claim 10 recites a data storage system with disk means (reference numeral 12, figure 1; page 5, line 15) for storing data, means (14, figure 1; page 5, line 16) for writing data to the disk in tracks and bands, wherein at least two tracks establish a band and wherein at least some bands are shingled, and means (28, figure 1; page 6, line 2) for controlling the means for writing. The means for controlling uses a log means (figure 3, page 9) for establishing a file system, and the log means uses a virtual address table (VAT) (58, figure 4; page 11, line 4) to remap sectors as required for shingled track writing.

Claim 18 sets forth a redundant array of independent disks (RAID) system including a RAID controller (page 11, lines 10-12) and a plurality of hard disk drives (10, figure 1; page 5, line 14). Each disk drive includes at least one storage disk (reference numeral 12, figure 1; page 5, line 15) and at least one drive controller (28, figure 1; page 6, line 2) reading data from and writing data to the disk. The drive controller for each disk drive is coupled to the RAID controller. The drive controller for each drive writes data in shingled bands using a log-structured file system (figure 3, page 9).

**(6) Grounds of Rejection to be Reviewed on Appeal**

(a) Claims 1, 2, and 4 have been rejected under 35 U.S.C. 103 as being unpatentable over Liu et al., USPP 2002/0071198 in view of Rosenblum et al. (non-patent publication submitted by Appellant) and Asano et al., USPP 2003/0147167.

1189-14.AJP

CASE NO.: HSI920030174US1

Serial No.: 10/674,081

July 23, 2007

Page 4

PATENT

Filed: September 29, 2003

(b) Claim 3 has been rejected under 35 U.S.C. 103 as being unpatentable over Liu et al. in view of Rosenblum et al., Asano et al., and Payne et al., USPN 6,212,047.

(c) Claims 6-8 have been rejected under 35 U.S.C. 103 as being unpatentable over Liu et al. in view of Rosenblum et al., Asano et al., and Ono et al., USPN 5,872,905.

(d) Claim 9 has been rejected under 35 U.S.C. 103 as being unpatentable over Liu et al. in view of Rosenblum et al., Asano et al., Ono et al., and Holland et al., USPN 5,367,669.

(e) Independent Claim 10 and dependent Claims 11, 15, and 16 have been rejected under 35 U.S.C. 103 as being unpatentable over Liu et al. in view of Rosenblum et al. and Ono et al.

(f) Claim 12 has been rejected under 35 U.S.C. 103 as being unpatentable over Liu et al. in view of Rosenblum et al., Ono et al., and Payne.

(g) Claim 13 has been rejected under 35 U.S.C. 103 as being unpatentable over Liu et al. in view of Rosenblum et al., Ono et al., and Asano et al.

(h) Independent Claim 18 and dependent Claim 19 have been rejected under 35 U.S.C. 103 as being unpatentable over Liu et al. in view of Rosenblum et al. and Holland et al.

(i) Claim 20 has been rejected under 35 U.S.C. 103 as being unpatentable over Liu et al. in view of Rosenblum et al., Holland et al., and Payne.

(j) Claim 21 has been rejected under 35 U.S.C. 103 as being unpatentable over Liu et al. in view of Rosenblum et al., Holland et al., and Asano et al.

(k) Claims 22-25 have been rejected under 35 U.S.C. 103 as being unpatentable over Liu et al. in view of Rosenblum et al., Holland et al., and Ono et al.

1189-14.APP

RECEIVED  
CENTRAL FAX CENTER

JUL 23 2007

PATENT

Filed: September 29, 2003

CASE NO.: HSI920030174US1  
Serial No.: 10/674,081  
July 23, 2007  
Page 5

## (7) Argument

The SPE signed the latest Office Action, meaning he has already considered the gravamen of the arguments below and rejected them despite having had the chance to use different grounds of rejection if he felt such was necessary. For this reason, reopening prosecution in lieu of submitting an examiner's Answer would be inappropriate.

a. Rejection of Claims 1, 2, and 4

Of relevance to amended Claim 1 is the allegation that Asano et al., paragraphs 107 and 108 teaches an error correction code (ECC) block size larger than a physical sector size of the disk, with a cumulative ECC parity state between successive partial writes of an ECC block being retained. This is wrong. Paragraph 108 indeed teaches a "long block" ECC that includes "N" 512 byte sectors in which the check bytes of multiple encoders are summed to generate shared check bytes, but then immediately distinguishes its method from an integrated interleaving technique by observing that the Asano et al. method works by summing check bytes, not data bytes.

There is no mention at all in paragraph 108 of Asano et al. of parity, much less that a cumulative ECC parity state between successive partial writes of an ECC block is retained as is otherwise recited in Claim 1. Indeed, because parity typically involves XORing "N" data bytes (not check bytes) to generate an extra (N+1) byte that subsequently can be combined with surviving data bytes to resurrect a lost data byte, paragraph 108 of Asano et al., which focusses on check bytes, plainly fails to implicate parity at all, much less in the way set forth in Claim 1. Apart from this, Appellant has been able to discern nothing in Asano et al. about

1189-14.APP

CASE NO.: HSI920030174US1  
Serial No.: 10/674,081.  
July 23, 2007  
Page 6

PATENT  
Filed: September 29, 2003

successive partial writes, much less retaining anything between them, much less still retaining a cumulative ECC parity state. The rejections under this section merit reversal.

In addition, while Rosenblum has been used for a teaching of a log-structure file system, nothing has been pointed to that the prior art recognizes using such a system either for the use of Liu, or as a vehicle that uses the ECC system of Asano. Indeed, no evidence has been produced that such a recognition existed prior to the recognition in the present specification on page 8 that such a log structure might find use in the context of Claim 1. Instead, on page 7 of the Office Action all that appears by way of a rationale to combine the log structure of Rosenblum with Liu is a weak reference to portions of Rosenblum about faster file writing and crash recovery without ever discussing why the skilled artisan might believe that these features would be desired or even achievable in the very different context of Liu.

In other words, the rejections utterly fail to explain why, specifically, the skilled artisan would believe that a HDD controller might use a log-structured file system defining segments that correspond to respective bands and/or tracks, when the system of Rosenblum appears to discuss neither and in fact mentions only a disk with segments and not that the segments define bands or tracks on page 4, right hand column.

Continuing with an exposition of the plucking of isolated unrelated teachings from the prior art that has characterized prosecution, nothing has been pointed to in Rosenblum to use an error correction code (ECC) block size larger than a physical sector size of the disk as recited in Claim 1, nor has any mention been pointed to in Asano et al. that might conceivably tie its ECCs to a log-structured file system. The only place that combination is remotely suggested is in Claim 1. All the examiner has done is in effect lifted statements from the references extolling their benefits in contexts that are different from the proposed combination advanced in the Office Action.

1189-14.APP

CASE NO.: HSI920030174US1  
Serial No.: 10/674,081  
July 23, 2007  
Page 7

PATENT  
Filed: September 29, 2003

The latest Office Action, page 19, alleges that certain things about ECC and parity are "well known". This is news to this prosecution, in which no such allegations have heretofore been made, and no evidence has been adduced of record to support the allegations. As recently cautioned by the Supreme Court in KSR Int'l, Inc. v. Teleflex, Inc., \_\_\_ S.Ct. \_\_\_ (2007), the proponent of unpatentability must meet its burden using *evidence*, of which there is none to support the last-ditch allegations related to what ECCs contain. In fact, as pointed out above to the extent that evidence exists relating to whether Asano et al. uses check or data bytes, paragraph 108 teaches the opposite of what is alleged on page 19 of the Office Action.

**b. Rejection of Claim 3**

Claim 3 inherits the patentability of its base claim.

**c. Rejections of Claims 6 and 8**

Claims 6 and 8 inherit the patentability of their base claims.

**d. Rejection of Claim 9**

Claim 9 inherits the patentability of its base claim.

**e. Rejection of Claims 10, 11, 15, and 16**

Of relevance to amended independent Claim 10 is the allegation in the Office Action that because Ono et al. teaches a VAT, and because Rosenblum et al. teaches a log, it would have been obvious to modify Liu et al. to arrive a log means that uses a virtual address table (VAT) to remap sectors as required for shingled

1189-14.AFP

RECEIVED  
CENTRAL FAX CENTER

JUL 23 2007

CASE NO.: HSJ920030174US1

Serial No.: 10/674,081

July 23, 2007

Page 8

PATENT

Filed: September 29, 2003

track writing. For reasons advanced above, this rejection appears to impermissibly pluck isolated teachings from disparate references to arrive at amended Claim 10, because (1) the relied-upon VAT in Ono et al. is not used by a log, nor is there any suggestion that it be used in a log structure; and (2) the relied-upon log structure in Rosenblum et al. is not used in shingled writing as indeed spelled out on page 8, lines 7-9 of the present specification, nor is there any suggestion to do so.

Thus, to arrive at the claims, the rejections have found it necessary to allege, contrary to what the present specification teaches about Rosenblum et al. and without any prior art evidence of support, that Rosenblum et al.'s log can be used in shingled track writing. Then, the rejections must make a second order leap, making an unsupported observation that the VAT in Ono et al. can be used in a log despite Ono et al. nowhere appearing to mention the word "log" at all. Claim 10 and its dependent claims are patentable.

This has been responded to on page 20 of the Office Action by an irrelevancy grounded in deep legal confusion. Specifically, the SPE brushes off the above argument by characterizing the asserted differences as mere "intended use", when in fact Claim 10 explicitly and unambiguously requires that the means for controlling uses a log means for establishing a file system, and further that the log means uses a VAT to remap sectors as required for shingled track writing. This is no mere "intended use" but a concrete claim limitation, rendering the response in the Office Action nugatory.

#### **f. Rejection of Claim 12**

Claim 12 inherits the patentability of its base claim. Furthermore, one or more of the arguments above might apply *mutatis mutandis* to the rejections under this ground of rejection.

1189-14.APP



CASE NO.: HSI920030174US1  
Serial No.: 10/674,081  
July 23, 2007  
Page 9

PATENT  
Filed: September 29, 2003

**g. Rejection of Claim 13**

Claim 13 inherits the patentability of its base claim. Furthermore, one or more of the arguments above might apply *mutatis mutandis* to the rejections under this ground of rejection.

**h. Rejections of Claims 18 and 19**

Because the Office Action fails to rebut, using evidence from the prior art or evidence as to the general knowledge in the art regarding shingled track writing, the teachings of the present specification that a log-structured file system as taught in Rosenblum et al. has not heretofore been suggested for use in shingled track writing, Claim 18 and its dependent claims are patentable. The only response the examiner has been able to muster to this argument on page 20 of the Office Action is the above-noted irrelevant argument concerning "intended use."

**i. Rejection of Claim 20**

Claim 20 inherits the patentability of its base claim. Furthermore, one or more of the arguments above might apply *mutatis mutandis* to the rejections under this ground of rejection.

**j. Rejection of Claim 21**

Claim 21 inherits the patentability of its base claim. Furthermore, one or more of the arguments above might apply *mutatis mutandis* to the rejections under this ground of rejection.

**k. Rejections of Claims 22-25**

1189-14.AFP

CASE NO.: HSI920030174US1  
Serial No.: 10/674,081  
July 23, 2007  
Page 10

PATENT  
Filed: September 29, 2003

Claims 22-25 inherit the patentability of their base claims. Furthermore, one or more of the arguments above might apply *mutatis mutandis* to the rejections under this ground of rejection.

Respectfully submitted,



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1159-14.ATT

CASE NO.: HSI920030174US1  
Serial No.: 10/674,081  
July 23, 2007  
Page 11

PATENT  
Filed: September 29, 2003

#### APPENDIX A - APPEALED CLAIMS

1. A hard disk drive (HDD) comprising:  
  
at least one rotatable disk;  
  
at least one write element configured for writing data to the disk in isolated tracks and in bands, wherein at least two tracks establish a band; and  
  
at least one HDD controller controlling the write element, the controller using a log-structured file system defining segments, each segment corresponding to at least one of: a respective band, and an isolated track, wherein the log-structured file system uses an error correction code (ECC) block size larger than a physical sector size of the disk, a cumulative ECC parity state between successive partial writes of an ECC block being retained.
2. The HDD of Claim 1, wherein at least some bands include at least three contiguous tracks.
3. The HDD of Claim 1, wherein the write element is configured for perpendicular recording.
4. The HDD of Claim 1, wherein the tracks within a band are shingled.
6. The HDD of Claim 1, wherein the log-structured file system uses a virtual address table (VAT) to implement shingled track writing.

1189-14.APP

CASE NO.: HSI920030174US1  
Serial No.: 10/674,081  
July 23, 2007  
Page 12

PATENT  
Filed: September 29, 2003

7. The HDD of Claim 6, wherein the VAT maps virtual sector locations to actual sector locations.

8. The HDD of Claim 6, wherein the VAT is stored on the disk in at least one of: a location with non-overlapping tracks where random access writes can be performed, and a region with shingled written bands, using a log structured storage approach.

9. The HDD of Claim 6, wherein the HDD is part of a RAID system including a RAID controller, the RAID controller accessing the VAT to remap sectors as required for shingled track writing.

10. A data storage system comprising:

disk means for storing data;

means for writing data to the disk in tracks and bands, wherein at least two tracks establish a band and wherein at least some bands are shingled; and

means for controlling the means for writing, the means for controlling using a log means for establishing a file system, wherein the log means uses a virtual address table (VAT) to remap sectors as required for shingled track writing.

11. The system of Claim 10, wherein at least some bands include at least three contiguous tracks.

1189-14\_APP

CASE NO.: HSI920030174US1  
Serial No.: 10/674,081  
July 23, 2007  
Page 13

PATENT  
Filed: September 29, 2003

12. The system of Claim 10, wherein the means for writing is configured for perpendicular recording.

13. The system of Claim 10, wherein the log means uses an error correction code (ECC) block size larger than a physical sector size of the disk means, a cumulative ECC parity state between successive partial writes of an ECC block being retained.

15. The system of Claim 10, wherein the VAT maps virtual sector locations to actual sector locations.

16. The system of Claim 10, wherein the VAT is stored on the disk means in at least one of: a location with non-overlapping tracks where random access writes can be performed, and a region with shingled written bands, using a log structured storage approach.

18. A redundant array of independent disks (RAID) system comprising a RAID controller and a plurality of hard disk drives, each disk drive including at least one storage disk and at least one drive controller reading data from and writing data to the disk, wherein the drive controller for each disk drive is coupled to the RAID controller, the drive controller for each drive writing data in shingled bands using a log-structured file system.

1189-14.APP

CASE NO.: HJS920030174US1

Serial No.: 10/674,081

July 23, 2007

Page 14

PATENT

Filed: September 29, 2003

19. The RAID system of Claim 18, wherein at least some bands include at least three contiguous tracks.

20. The RAID system of Claim 19, wherein the disk drives are configured for perpendicular recording.

21. The RAID system of Claim 19, wherein the log-structured file system uses an error correction code (ECC) block size larger than a physical sector size of a disk, a cumulative ECC parity state between successive partial writes of an ECC block being retained.

22. The RAID system of Claim 19, wherein the log-structured file system uses a virtual address table (VAT) to implement shingled track writing.

23. The RAID system of Claim 22, wherein the VAT maps virtual sector locations to actual sector locations.

24. The RAID system of Claim 22, wherein the VAT is stored on the disk in at least one of: a location with non-overlapping tracks where random access writes can be performed, and a region with shingled written bands, using a log structured storage approach.

1189-14.APT

CASE NO.: HSI920030174US1  
Serial No.: 10/674,081  
July 23, 2007  
Page 15

PATENT  
Filed: September 29, 2003

25. The RAID system of Claim 22, wherein the RAID controller accesses the VAT to remap sectors as required for shingled track writing.

1189-14.APP

**CASE NO.: HSI920030174US1**

**Serial No.: 10/674,081**

**July 23, 2007**

**Page 16**

**PATENT**

**Filed: September 29, 2003**

**APPENDIX B - EVIDENCE**

None (this sheet made necessary by 69 Fed. Reg. 155 (August 2004), page 49978.)

1189-14.APP



CASE NO.: HSI920030174US1  
Serial No.: 10/674,081  
July 23, 2007  
Page 17

PATENT  
Filed: September 29, 2003

**APPENDIX C - RELATED PROCEEDINGS**

None (this sheet made necessary by 69 Fed. Reg. 155 (August 2004), page 49978.)

1189-14.A17